SYSTEMS AND CONTROL PROCESSES

RESEARCH OF OPPORTUNITIES FOR ADAPTATION OF COMPUTER-INTEGRATED MIXTURE PREPARATION SYSTEMS TO CONDITIONS OF FOUNDRIES IN UKRAINIAN ENTERPRISES PRODUCING WEAR-RESISTANT CAST IRON

page 4–7

The problems associated with the possibility of adaptation of modern computer-integrated control systems for control of imported mixture preparation equipment to the conditions of the foundries in Ukrainian enterprises are considered. It is emphasized that ensuring the given quality of a mixture is an important factor in determining the performance characteristics of wear-resistant cast iron castings. It is shown that the use of modern imported mixture preparation systems suggests the possibility of supplementing by models and algorithms of Ukrainian developments in the synthesis of molding compounds, and optimal control of mixture preparation processes. Proposed options that can complement the QualiMaster AT1/SandReport/SandExpert system are a variant of its adaptation to the conditions of foundries of the Ukrainian enterprises. These options are based on mathematical models «mixture composition – mixture properties» in the form of regression equations and algorithms for optimal control of mixture preparation sections. The use of these solutions provides the ability to improve performance, particularly durability of wear-resistant cast iron castings, working in conditions of intensive abrasive friction. This is due to the fact that factor in improving the durability is high quality of working surfaces formed at the «casting surface — molding sand» interface.

Keywords: molding sand, computer-integrated technology, mixture preparation section, controller synthesis.

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DETERMINATION OF THE RIGIDITY PARAMETERS OF SPRING SHOCK ABSORBERS

page 8–12

The article discusses the methods of reducing errors of spring shock absorbers thereby increasing their damping characteristics to improve systems, shock and vibration protection, used in navigation systems for mitigating the effects of negative factors on control device during the action of vibrations or shocks.

With the increasing precision and quality of navigational devices has increased the requirements for quality spring shock absorbers, therefore, at the design stage it is necessary to reduce the presence of negative factors of spring shock absorber.

The breaking forces into components and splitting the geometry of the absorber in part, presents the methodology of calculating of the segments of the spring shock absorber with integrals Mora.

The methodology will be useful to design engineers when creating systems of depreciation in the navigation device. The technique allows to reveal places with low damping characteristics and in the design phase to make adjustments to improve the characteristics of the elements are calculated.

Keywords: calculation, shock absorber, rigidity, navigation systems, vibration, shocks, damping characteristics.

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MANAGEMENT OF THE INTERNET SHOP CONVERSION

page 12–14

This article discusses the website modernization strategy: its design, number of areas for selling pages, presence of drop-down menu and prompts, design of selling pages, their colors, brightness, etc.

The main aim of research is to develop methods for evaluating the effectiveness of different strategies for upgrading the website to increase sales and simulation of conversion control systems. Set of critical parameters that affect the sales growth is defined.

To keep the interest of customers website design is periodically updated and modernized (new services in the form of «hot» keys, tips and on-line consultations are added). Selecting the modernization strategy should be carried out for efficiency reasons, optimizing the ratio «upgrade costs — increasing the number of sales».

Modernization strategies for different segments of potential customers and the different product groups differ.

This article discusses the most popular site modernization strategy: change in the number of areas for selling pages, change the color and size of areas for selling pages, add drop-down menu.

The developed method allows predicting the change in the level of Internet shop sales for each of the three proposed strategies for upgrading the website.

The authors estimated weighting factors of influence of changes in various areas to increase the conversion; analyzed the effectiveness of demand management systems, presented additional profit-capital ratio for improving the selling pages.

The research results can be used by developers involved in the field of web design, as well as in the design of demand management systems.

Keywords: website, conversion, control system, strategy, modernization, market segment, selling page.

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RESEARCH AND ANALYSIS OF DYNAMICS OF PUMP UNIT CONTROL PROCESS

page 15–19

This article analyzes the dynamics of the water supply system and shows the results of author's research in this field. The main aim of this research is evaluation of the effect of pipeline parameters on stability of water supply system. It is necessary to find a pipeline length at which the water supply system remains stable. This article discussed the stability research of water supply system with pipeline connection via the Nyquist frequency method. The obtained dependence allows getting the pipeline length at which the system remains stable under any perturbations. Researches show that the pipeline parameters directly affect the stability of the system that need to be considered in the design of water supply systems. The author proposes to use the results for design of water distribution networks in order to ensure the stability of the control system. The research results can be used by designers of water supply systems, automation and remote control, engaged in the field of water supply.

Keywords: dynamics of the pump unit, pipeline parameters, system stability.

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GAS-DYNAMIC CALCULATION OF TECHNOLOGICAL OPERATING PARAMETERS OF MULTILAYER GAS STORAGE FACILITIES (ON THE EXAMPLE OF PROLETARSKE)

page 20–24

This article analyzes the work of multilayer underground gas storage facility. Practical material was compiled in the basis of this analysis. These data were the basis of the calculation methodology of technological operation parameters for multilayer storage facilities during the injection and extraction of gas.

To calculate the technological operation parameters and their dynamics during injection of gas the following data are given.

The maximum layer pressure was determined taking into account the capacity of the existing gas compressor units and capabilities to ensure the necessary operating pressure in the mouths of wells.

Minimum layer pressure for horizons was adopted for the results of development with regard to provision of anhydrous operation of wells and free-current gas supply to the pipeline-connection at the end of the extraction season.

Maximum pressure drawdown was taken as a result of development of deposits and filtration coefficient of resistance — as a result of gas-dynamic studies of wells.

Keywords: layer pressure, filtration resistance coefficient, pressure drawdown, daily gas extraction, total layer rate.

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IMPROVING THE STRUCTURAL SCHEMES OF OPTICAL DUST MEASURING INSTRUMENTS

page 24–30

This article describes the structural schemes of the next optical dust measuring instruments: single-channel, dual-channel, fixed, mobile, application features and specifications. The main aim of research is to improve the accuracy of measuring the dust concentration and reduce the measurement error due to the invariant schemes of construction of the optical dust measuring instruments.

Use of optical dust measuring instruments is important to monitor the protection of the environment, including health standards, certification of workplaces. It is cause of both periodic and continuous monitoring of the dust concentration with automatic dust measuring instruments that implement different methods of dust measurement in visibility on the operating conditions, operating mode, measuring range, requirements for speed and reliability.

The choice of structural construction of dust measuring instruments is proved depending on the range of dust concentration. Proposed Use of invariant schemes for construction of dust measuring instruments: gravimetric and optical with physical equivalents.

Keywords: dust, particle, dust measuring instrument, air, method, detector, measure instrument, optics, photometer, gravimetry.

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ASSESSMENT OF QUALITY OF VEGETABLE PRODUCTS ACCORDING TO ELECTRIC CHARACTERISTICS

page 30–35

Vegetables are important food products, therefore practical methods of control for concentrations of useful and harmful elements in vegetables make actual issue for the research.

Vegetable juice is object of the research. Subject of the audit is defined by dependence of electrical properties of juice, containing sodium and cuprum ions on concentrations of these substances in the juice.

Aim of the research is to develop a quick method to determine concentration of useful minerals and harmful substances in the vegetable juice according electrical parameters.

The method of control for quality parameters of vegetable juice, proposed by the author, is based on immittance method. Main units of measuring tools for immittance control of quality parameters of vegetable juice are a capacitive transducer, RLC-meter and block of results processing and control (PC).

Principle of measuring tools operation expects: under laboratory conditions the model fluids are created, i. e. carrot juices of known characteristics, which are placed in a capacitive transducer with square graphite electrodes which are completely immersed in the liquid; RLC-meter in asynchronous mode transfers a test signal to the capacitive transducer; in response the model liquid characteristics come to the RLC-meter (active and reactive components of the electric conductivity of juice).

Studies of the model fluids have resulted in determination of dependency of active and reactive component of the conductivity on chemical nature and concentration of useful minerals and harmful substances. The measured values are compared to the set values for comparison. Results of the comparison help to make conclusions about content of harmful substances. Measuring is done in few seconds and can be used in real production conditions for quick quality control of vegetables.

Keywords: immitance, admittans, conductometric cell, electrodes, capacitive transducer, fluid model.

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MODELING THE OCCUPATIONAL HEALTH PROJECTS INITIATION USING MARKOV CHAINS

page 35–39

The use of Markov chains in the project-oriented management in the field of occupational health is discussed and some of the research results of occupational health projects initiation phase are shown. The main aim of this study is to develop a model of occupational health projects initiation with the influence of the project customer. It was determined that the projects initiation is carried out through the communication links between the four entities of the projects: project team, project environment, project itself and project customer, and the result of the projects initiation stage is generated during the communication based on the consistency of stakeholder requirements and adoption of the basic concepts of projects, definition of project goals, project planning, assessment of requirements to the level of specialization and competence required for formation of the project team. The proposed Markov chain for projects initiation take into account the changes in the state of the occupational health management system in the enterprise, and allows to create recommendations for the occupational health initiation. The mathematical description of the projects initiation model using Markov chain can simulate the quantitative parameters of the system, namely, changes in the probability of the system conditions. Markov model allows have influence of each entity have of project activities at the time of project initiation.

Keywords: project initiation, Markov chain, occupational health, marked graphs, proactive management.

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ANALYSIS OF THE EFFICIENCY INDICATORS OF CARGO DELIVERY DISTRIBUTION SYSTEM

page 40–44

This article is highlighted results of the studying the main characteristics of the cargo delivery distribution system and studied regularities of deliveries by road transport, which was the aim of the article.

The methods of field observations to collect statistical information and statistical analysis methods for establishing and verifying the adequacy of regression were used in the article.

Literature review shows that the most effective method for studying topological structures of cargo delivery is simulation. Patterns of changes in key parameters of the distribution system were studied for its reliable implementation. There are: time, cost and reliable of cargo transportation.

The dependences and characteristics of change the basic characteristics of the distribution system create the basis for further adequate simulation modeling of goods delivery process in distribution systems, which will examine the impact of different topological organizational structures of distribution and inventory management strategies on the efficiency of delivery. The results of this simulation, in the opinion of the authors, will enable to determine the optimal volume of goods delivery in concrete terms of delivery system and its effective topological structure for the appropriate transport technologies.

Keywords: transportation, efficiency, reliability, model, logistics, delivery.

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INFORMATIZATION DEVELOPMENT OF INNOVATIVE TECHNOLOGIES FOR PROCESSING POLYESTER YARNS

page 45–51

The process of informatization of technological innovation of textile production — emulsifying polyester yarn is investigated by applying computerized color measurement systems and programs to meet the challenges of production coloristics in the production technology of finished products.

Directions of increasing efficiency of technological processes is proved for production of the finished, painted under the specified standard polyester yarn by controlling the workflow in which the color is represented in digital form and can be adapted to the innovative technology of surface treatment of the textile substrate.

The effect of emulsification process is investigated on the color characteristics of the painting coloration, obtained by dye class — Sumikaron on polyester yarns. It was found that treatment by Cololub 150 and Cololub C avoids dichroism of Sumikaron Red SE-RPD and Sumikaron Rubine SE-RPD dyes, and for Sumikaron Yellow SE-RPD dye, preliminary emulsifying polyester yarn causes increase the color intensity with increasing dye concentration on the fiber at high dyeing values (more than 3 %).

It was found that for all dyeing made to emulsifying polyester yarn is observed a linear color change when changing the concentration of the dye, which is extremely important for more accurate color reproduction with automatic calculation of the formulations under standard dyeing.

By using automatic calculation formulas and formed colorimetric data base and substrates treated by modern perspective emulsifiers, it is shown that considered innovative technologies are potential for cost reduction of dyed polyester yarn.

Keywords: informatization of technological innovation, emulsifying polyester yarn, dyeing under standard, prime cost.

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TECHNOLOGY TRANSFER IN THE TRANSPORT INDUSTRY

DEVELOPMENT OF THE INDICATOR'S SYSTEM FOR QUALITY CONTROLLING VEHICLES' PROCESSES OF MAINTENANCE AND REPAIR

page 52–56

The article deals with the system of indicators developed on the basis of vehicle maintenance and repair for the quality control.

The system of working environment indicators was detected on the basis of the analysis of maintenance and repair processes. On the basis of a linear regression model and researches the dependence for the degree of importance of each indicator calculation is detected.

The analysis found that the proposed system of indicators has properties necessary and sufficient for the assessment of the company for the maintenance and repair of vehicles which include organizational and technical support; production facilities (buildings, structures); technological equipment, accessories; staffing; control and diagnostic, test equipment and means of measurement; regulatory, technical and technological documentation. The parameters of the maintenance and repair of vehicles carry the full amount of information that reflects the requirements of the certification system (or declare). Some of the indicators are found to consist of a number of components. Hence there is a need to describe these indicators by means of their constituents, and then choose the most significant and important for the final result of certification (or declare).

The number of components for assessment of the level of performed work of the company is defined for the first time. After selecting the most important and significant component the system of indicators for the final result of certification or declaration is determined.

In the result of the research the defined indicators make it possible to compare companies with each other, to assess the whole market for the maintenance and repair of vehicles.

Keywords: quality, maintenance and repair of motor vehicles, system of indicators.

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MATHEMATICAL MODEL OF SELECTING THE ELEMENTS OF WEATHER MONITORING SYSTEM FOR HIGHWAY

page 57–61

Analyzes of approaches and methods of synthesis of intelligent transport systems are conducted. The implementation of intelligent transport systems will improve traffic management safety, provide reliable transportation and preservation of vehicles and cargo, and improve environmental protection. For prompt consideration of the impact of meteorological factors it should be used a system of meteorological service that will quickly decide on necessary actions in a particular stretch of road. Mathematical model of selecting the elements of weather monitoring system for highway were developed. The model refers to problems of discrete programming with Boolean variables, for their implementation it is proposed to use: for the tasks of small dimension — exhaustive search of options; for the tasks of large dimension — the method of random search. An example of selecting the elements of weather monitoring system was considered. The prospect of further research is to develop software that will automate the process of synthesis of intelligent transport systems.

Keywords: intelligent transport system, weather monitoring, mathematical model, multicriteriality.

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INFORMATION AND CONTROL SYSTEMS

USING PHOTONIC-CRYSTAL FIBERS IN TELECOMMUNICATION SYSTEMS

page 62–67

This paper describes the advantages of using photonic crystal fibers in telecommunication systems. The relevance of the study is related to the fact that a large number of applications, such as the event in miniature sources of light of several wavelengths of new generation, based on the addition of the active functionality, ultra-sensitive sensors, optical memory functions, require a high quality factor and single-photon sources of light. Photonic crystals are expected to be used in novel optical devices such as non-threshold laser diodes, LEDs single mode, waveguides with small losses low, sharp bends, small prisms and optical integrated circuit. They can even operate as a «left-handed materials», which are able to focus the waves transmitted in the sub-wavelength place due to the negative refraction. Photonic crystals could solve many of the problems that currently limit the speed and capacity of optical communication networks. For example, photonic crystals may be used to create new LEDs and lasers, which emit light in a very narrow wavelength range, as well as optical filters with high selectivity, which can be integrated on a single chip.

Keywords: dispersion, distribution, photonic crystal fibers, telecommunication systems.

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